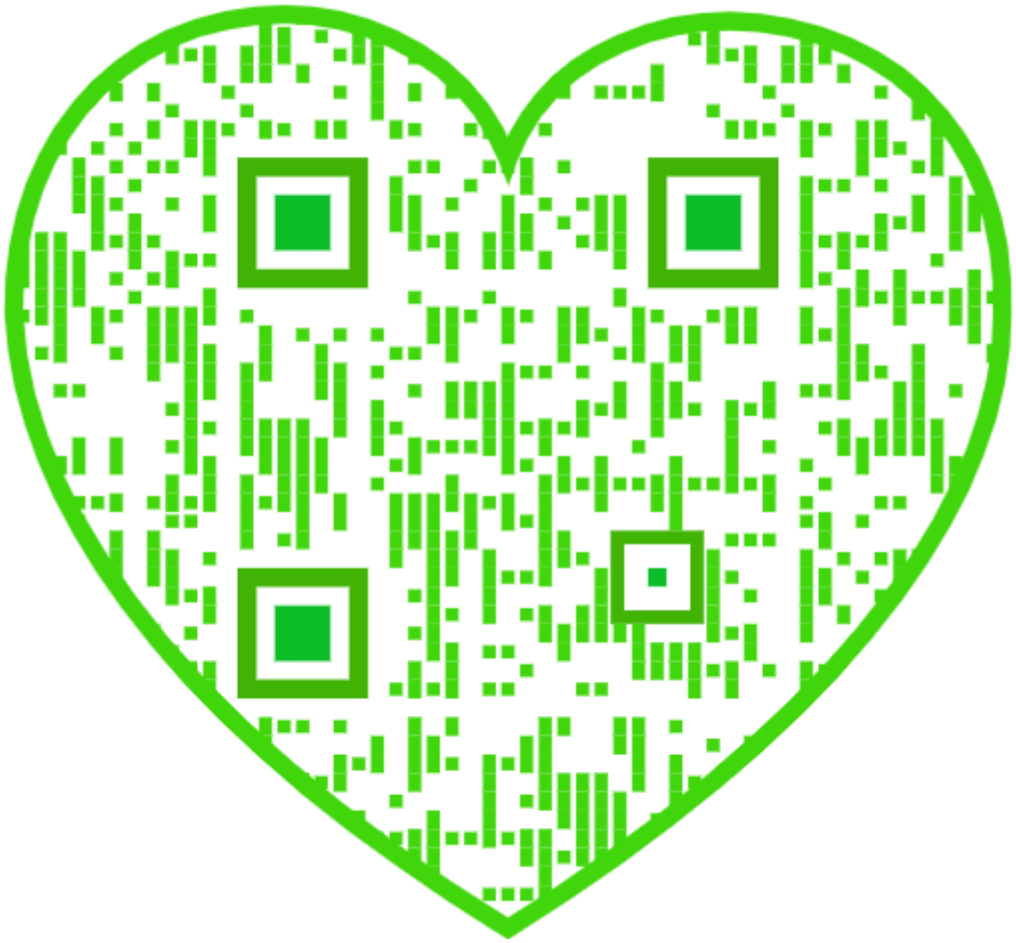

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Sac. & Atl. R. R. Co
Wm. I. C. Woods.

THE BEST DRIVING WHEEL

FOR

FREIGHT ENGINES.

THE

CAST IRON CHILLED SLIP TIRE,

CONFINED WITHOUT STRAIN, TO A CAST IRON CENTER.

Patented April 10, 1843, by Thatcher Perkins, and Wm. McMahon, of Baltimore, Md. and by them assigned to L. B. Tyng.

ZERAH COLBURN,
SOLE AGENT UNDER THE ASSIGNEE OF THE PATENT.

NEW YORK CITY.
1853.

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The subscriber, in offering to Railway Companies, Railway Contractors, and Locomotive Builders, the solid and HOLLOW CAST IRON CHILLED SLIP TIRES, for which he is sole Agent, (under the assignee of the patent) for the United States, begs attention to the following practical statements of their ADAPTATION, SERVICE and ECONOMY.

ZERAH COLBURN.

Printed by B. H. Penhallow,
28 Merrimack Street, Lowell.

CIRCULAR.

THE principle of the use and application of the chilled, cast iron tire, for Engine Drivers, was long ago developed in the business of some of the great Freight Railroads of this country. It was tested with a view to greater strength and wear, and to a saving in the expense of "*shoeing the locomotive.*" Upon the **Baltimore and Ohio Railroad,** where the present patented method of applying these tires was first introduced, they have superseded **every thing else,** and upon *no* road could these parts of the rolling stock be more *fully tested.* The great physical features of this road present a succession of extreme difficulties, and challenge all other lines for the severe and effectual test they give the motive machinery. The engines of this Road are of Thirty tons weight, for first class capacity, and have from six to eight coupled drivers of from 43 to 50 inches diameter only. It is evident that such engines exert *great power,* and are subject to *great wear.* The grades overcome are, in some cases, 116 feet per mile, for eleven miles. Out of the first 100 miles west of Cumberland, one third of the distance is upon grades exceeding 100 feet per mile. The curves are very sharp, being as short as 500 feet radius on some parts of the line. The summit elevation of the road is 3000 feet above the sea, and in winter is a region of intense cold. So far as **shocks, constant strain, hard wear** and **frost,** can affect a tire, these tires are fully tested. Upon this road, under all circumstances of freight and passenger transportation, these tires perform faithfully, **without one failure.** They run **one and one half millions of miles yearly,** and are admitted to save **Thirty Thousand Dollars yearly,** in repairs, over what would attend the use of the

wrought iron tires, for similar service. The Philadelphia, Wilmington and Baltimore Railroad; the Eastern Railroad, in Massachusetts; the Boston and Lowell Railroad; the Boston and Providence Railroad; the Ohio and Pennsylvania; Cincinnati, Hamilton and Dayton; Cleveland, Columbus and Cincinnati; Mad River, and other Railroads, are now using the cast iron chilled tire, with every result of **safety, durability** and **economy.**

The entire experience with these tires shows the cast iron chilled surface to have some very positive advantages over wrought iron, and in no essential respect is it at all inferior.

Its claims, where it is attached to a cast iron center, are, above the ordinary wheel with wrought tire: —

First: **Greater strength, to resist sudden fracture.**

Second: **Equal, or greater durability, for constant service.**

Third: **Equal adhesion.**

Fourth: **Fifty per cent. less expense in its first application.**

Fifth: **Seventy-Five per cent. less expense in its subsequent maintenance and renewals.**

The evidence is here given, requisite to support each of these claims.

First: **Greater strength.** These tires **never burst** or crack through. This is not predicted, but is the **result of the experience** in their use. The Baltimore and Ohio Railroad have 141 engines fitted with chilled tires or the whole chilled wheel; the majority, say 100, having the removable tire, and in the whole experience of ten years only two tires, of the first, very light pattern, have ever broken. These were among the first used; were but $1\frac{3}{4}$ inches thick, and were cast without the present experience in chilling which the founders now possess. The Road uses these tires on all their **passenger engines,** and runs them on the heavy trains between Baltimore and Washington as fast as 40 miles per hour.

That the wrought iron, shrunk tire, often bursts in cold weather, is very well known by Railroad men; indeed they are quite often burst in shrinking them on. The principle of their application explains this. The contraction of a tire upon an unyielding wheel center brings the same enormous strain upon it as would be required to stretch the tire bar, when cold, for **half an inch.** At a low tem-

perature the strain is increased as the contraction of the wrought iron exceeds that of the cast iron wheel center, while the shocks upon the wheel are greatly increased from the rigidity of the frozen track. The Eastern Railroad, in Massachusetts, used a set of 5 feet chilled tires under one of their passenger engines for upwards of 50.000 miles run, without failure, although a number of wrought iron tires burst during the same time. The cast iron tire is secured in the firmest, and, by experience, the most secure manner, and **without any strain.**

The chilled tire will not become broken in the flange, unless caused by running off, with great force, upon a frog or switch. The trucks are especially exposed to this breakage, and their failure is the most dangerous in its results, yet the truck wheels are universally of cast iron.

The New York and Erie Railroad has four of its heaviest engines, (two being of thirty-seven tons weight each,) provided with chilled drivers, and they are constantly employed as assistant engines upon the most elevated and difficult points on the line. They answer always without failure. This road has seven engines in all, using the chilled wheel, and six of these are the **most powerful** on the road.

Second: **Equal or greater Durability.** The duration of a set of 2 inch thick, Best Bowling, tires of 6 feet diameter, is for an average, 75.000 miles run. This is the whole duration before and after re-turning. The 5 feet chilled tires on the "main stem" of the Baltimore and Ohio Railroad run the same distance. The same tires run 100.000 miles between Baltimore and Washington, with heavy passenger trains. The wrought tire requires turning down, say, three times in this service;—the chilled tire does not need any thing of the kind.

The duration of the chilled tire running freight over the mountains upon the Baltimore and Ohio Railroad, is 2½ years, or about 50.000 miles. These are upon 43, 46 and 50 inch wheels, coupled 6 or 8 to an engine. The officers of this road say they could not reasonably maintain the wrought tires, as the sand they would use upon their mountain grades, **would soon cut them out.**

A set of six chilled wheels of 48 inches diameter, have been in use upon one of the freight engines of the Boston and Lowell Railroad, for upwards of 27 months, **and show no signs of wear.**

The duration of these tires is **fully equal** to that of the **best Bowling tire**, and **exceeds it** in bad situations, as in gravel banks or about stations. The chilled tires will do good service for **two years, in depot yards**, shifting out cars, where the engine is constantly starting, reversing, or stopping, running over switches, and using sand upon a wet or greasy rail.

Third: **Equal adhesion.** The trials upon the Philadelphia and Reading and upon the Baltimore and Ohio Railroads, will prove this claim. The first heavy engines on these roads had eight drivers with wrought iron tires. These were changed to chilled tires, or chilled whole wheels, and were found to draw the same train in the same time, showing **no difference in the adhesion.** Afterwards the front wheels of these engines were removed, and a pair of small leading wheels, or a truck, substituted in place, leaving but six connected chilled wheels. **No difference in the work done** could then be perceived. This shows that many engines have a **surplus of adhesion**; more than what is made available by the tractive power of the engine, or power derived from the pressure of steam acting in the cylinders. **All the 30 ton engines now building** for the Philadelphia and Reading and the Baltimore and Ohio Railroads, have **six coupled chilled wheels only.** The change has been made upon other roads, with four and with six drivers, and the chilled tires have been found, in all cases, to perform equally as well as the others. Reference to many of the parties who will support these statements, will be found at the end of this Circular.

The Engine "Milo," which received the **gold medal** for the best performance at the Locomotive trial, made in connection with the Lowell Fair, at Wilmington, Mass. Oct. 2d, 1851, **had chilled drivers**, and the same engine has always maintained the reputation of the **prize engine** upon the Boston and Lowell Railroad.

It must be remembered that many enginemen do not start a train without slipping the drivers, of whatever number and material. The practice of "slipping the wheels" is very injurious to the tires and to the rails, and with coupled drivers is never necessary. No engine can at once start a heavy train from a dead stop into full working speed, either by using sand or by slipping the drivers. The chilled tire possesses as much effective adhesion as is ever required to start in a proper manner.

Fourth: **Fifty per cent. less expense in first application.** The following statements based upon the average expense of different roads will support this claim. The statement does not include items which are the same for both kinds of tires, such as turning wheels or boring tires, turning or fitting crank pins, etc.

Cost of applying a set of four 5 feet tires of wrought iron, including cast iron wheel centers.

5,200 lbs. Drivers,.....at 3 cents,.....	....$156,00.
2,650 lbs. Tires,.....at 11 cents,.....	291,50.
3 days' labor setting,....at $1.50,.....	4,50.
5 days Squaring and turning, at $3.00,....	.....15,00.
Rivets, Tools, Extras, etc.....	.....3,00.
	$470,00.

Cost of same set for chilled tire.

7,600 lbs. Castings, (wheels and tires) at 3 cts.	$228,00.
Bolts, etc.....	3,00.
Labor applying tires,.....	3,00.
	$234,00.

Showing a saving of full 50 per cent. All other sizes are applied at a proportionate reduction of expense.

Fifth: **Seventy-Five per cent. less expense for subsequent maintenance and renewals.**

Cost of maintaining and renewing a set of 5 feet wrought iron tires, for the length of their duration. (75,000 miles.)—*N. B.*—Boring out tires is not included, it being the same for each tire.

Three times turning, 3 days each, 9 days at $3,...	$27.00
" " takingout, 5 dys. ea. 15 dys., at $1.33⅓,	20.00
Detention of Engine for turning tires, 12 days, at $5,	60.00
5 days getting wheels from under Engine, and removing tires, at $1.33⅓,.....	6.67
3 days setting tires, at $1,33⅓,.....	4.00
2650 lbs. new tires, at 11 cents,.....	291.50
Tools, Bolts, etc.....	3.00
5 days squaring and turning new tires, at $3,.....	15.00
3 days getting in wheels, at $1,33⅓.....	4.00
7 days detention of Engine, at $5,.....	35.00
	$466.17

Cost of renewing and maintaining the same set for chilled tire.

Turning, detention, etc. during service,.....00.00
Renewing 3600 lbs. tire, at 3 cents,.....$108.00
Bolts, to replace a few broken in getting out,.....50
Labor in changing,.....3.00
Detention of Engine 1 day,.....5.00

$116.50

Or a saving of full seventy-five per cent. The chilled tires are changed at any time, without taking the wheels from the engine, or letting off steam. *In fact* a set may often be changed between two trips, so as not to detain the engine at all.

The facts that have been given will show fully the durability, safety and economy of the chilled tire. It will also readily occur to the mind of any one acquainted with Railroads, that *less machinery is required for repairs* where these tires are generally used; *fewer engines will do the same yearly business, and less value of stock will be invested in anticipation of renewals.*

TO MASTER MECHANICS.

Having stated the advantages of the **patent slip, chilled tire,** the Agent wishes to make **the necessary distinction between this and the whole chilled wheel.**

The chilled surface is the only point for which we contend in the discussion of its durability, safety, or adhesion. But **as to its economy, the removable tire,** although costing a trifle more at the outset, **is more than 50 per cent. cheaper to maintain. Its security of application is complete,** where it is held upon a conical surface by means of hook headed bolts, passed sideways through the rim, the body of the bolt lieing in the rim of the wheel center. This is the general method of holding the chilled tire, and is used entirely upon 100 of the Baltimore and Ohio Railroad Engines. It never allows the tire to work off,—on the contrary **the tendency is to work the tires till further on the rim.** The great beauties of this plan are its **simplicity, expedition of renewal,** and its **entire safety**; by all of which, it relieves the men engaged with the engines, from a great deal of care, and saves the road a great expense. The wheels are turned and the tires bored by gauges, so that no difficulty need be had in having sets of tires bored out and kept on hand, ready for changing.

To renew the whole wheel is equivalent to throwing aside half the material as good as new, and the absolute waste of all the fitting of the wheels, crank pins, etc. together with the labor of getting the wheels from under the engine, replacing them, re-setting valves, etc. Some mechanics say that the crank pins are of no account, as they will not outwear a set of tires, and that in either case they would require to be renewed. But, on the Baltimore and Ohio Railroad, **the crank pins outwear three or four sets of tires.** They case-harden their crank pins, while Winans welds a sheet of steel around the crank pins of his last Engines, and turns the journal in that.

The extra expense of boring tires and turning wheels is about $4 per wheel, for the first application of the chilled tire. The items of cost in changing the wheels would stand as follows:—

Cost of renewing 4 Chilled Drivers of 5 feet diameter.

4 Wheel Castings, 7,200 lbs. at 3 cents,	$216.00
4 Men, 2 days each, getting wheels out and off axles,	12.00
3 days' labor boring and squaring wheels, at $3,	9.00
175 lbs. crank pins, at 7 cents,	12 25
Turning do. do. 4 pins, at $2,	8.00
Fitting do. do. at 75 cts.	3.00
Drawing on wheels, fitting keys, etc.	12.00
4 Men 1½ days each, getting wheels under engine, replacing connections, setting valves, etc. 6 days.	9.00
6 days detention of engine, at $5,	30.00
	$311.25

For Chilled Tire: Relative expenses for renewing.

To $116.50, the sum stated on page 8, add $8 for boring tires, and the expense is $124.50,—saving $186.75 for each renewal of 4 wheels. From this deduct one third of the expense of a set of crank pins, fitting, etc. say $10, allowing one set of pins to outwear 3 sets of tires,—the saving is full $175 for every renewal. Indeed it may be said that nearly **the whole advantage** derived from a substitution of chilled cast iron, **is held by the removable tire only.** The form of tire, recommended by the assignee of the patent, is a hollow tire, having a whole depth of six or seven inches, and secured to a double plate center. This is the lightest and strongest form. The advantages of the double plate are well known to be **strength, even chill of tire, easy movement in the air,** not fanning the track, and **convenience in counterbalancing, and in cleaning.** The spoke wheel, with chilled rim, can seldom be evenly chilled opposite the ends of the spokes.

Mechanics who can look at this subject, without prejudice, should witness the success of these tires upon many roads where they are in use, and are recommended to try them upon one or several engines, and to keep fair accounts of their expenses. We submit our statement to them, and ask them candidly to tell wherein the merits of the chilled tire have been over-estimated.

The only objections which are ever urged against the chilled tire are, that it may possibly break, and that it has not enough adhesion. It needs only a fair trial to satisfy any one that these statements are groundless. To prove its greater security, we have alluded particularly to its history upon the most difficult road in the country; and it is plain that a wheel which can endure the hardest service is adapted to smooth roads, without any risk. The engines to which we refer, are also worked to their full power, and it is evident that any loss of adhesion would be at once regarded, but no such loss is admitted by those having the wheel in use.

TO MEN FINANCIALLY INTERESTED IN RAILWAYS.

The facts which have herein been brought to your notice, have an important application to the subject of Railway Economy. We have shown a saving of $235 in the first application of a set of chilled tires to a four-driver engine. The average saving for first class freight engines, with *six* drivers, would be $300 each, (increasing with the number of drivers,) which would be made either in favor of the road or of the builder. This sum, upon a road having 150 freight Locomotives, as the New York and Erie Railroad will soon have, would be **a saving of Forty-Five Thousand Dollars in the first cost** of motive power. The yearly saving to such a road would be $140 on each four-driver engine, or an average of, say $175, throughout their whole stock, making **an annual saving of Twenty-Six Thousand Two Hundred and Fifty Dollars.**

Let each of the great Freight lines, the Pennsylvania Central; the Reading; the Ogdensburgh; the Rutland and Burlington; the Vermont Central; **and the great Roads of the West** — to whom this improvement recommends itself in every consideration of climate, efficiency or economy; — let each make its own estimates,— there will be found a great sum saved to the capital of the country. The improved tire saves more than half the expense of first cost, and what is spent at all is retained in our own country, and is not carried from our own shores to England. Recollect, gentlemen, that these statements **are not imaginary**; — the actual saving **is now realized** for every engine using the improvement. **It has been realized** on important lines **for a series of years.** The Baltimore and Ohio Railroad Engines, running over the hardest line in the country, and working up to their full capacity, show an average expense for repairs of five cents per mile, run in the year 1852. The expense upon

the Erie Railroad averaged eight and a half cents per mile, or seventy per cent. more than upon the Baltimore and Ohio Railroad; and very much of this saving upon the latter Road is due to the general adoption of this improvement. And the direct saving of so much capital and annual outlay must operate to reduce the amount of capital sunk in fixtures indirectly chargeable to repairs. As the saving is clear and entire, not a removal of one expense followed by the substitution of a greater, so must the effect extend to such a circle of accounts.

And now, having set forth the economy and safety of the chilled tire, it is proper to make a clear distinction between that improvement and the whole chilled wheel. The latter has the same efficiency and safety, but is attended with a far greater expense for maintenance, the average difference in the renewal of a set of six wheels being $225, or a saving of one hundred dollars per engine, per year, in favor of the removable tire, which, for 150 Engines, would amount to Fifteen Thousand Dollars per year. The renewal of the whole wheel is unmechanical in principle, is very expensive, and is attended with no advantage to offset either of these objections.

TESTIMONIALS.

BALTIMORE AND OHIO R. R. OFFICE,
January 2d, 1850.

MR. L. B. TYNG, Lowell, Mass.

Sir: — Your favor of the 26th ult. is before me, asking my opinion of the Chilled Cast Iron Tires, of Messrs. Perkins & Mc Mahon, patentees. I do not hesitate to speak favorably of them, nor to say that I would give them the *preference* over wrought iron tires, whenever the adhesive tenacity of the latter to the rails is not *all* called for, there being somewhat less adhesion to the chilled wheel.

This can, however, scarcely be called a practical point, as nearly all of the Passenger Engines now in use, have a *surplus of adhesion*, and nearly all Freight Engines being provided with the sand box, for emergencies arising from sharp curves, heavy grades or wet rails.

The Chilled Tire is very much cheaper in first cost, will last longer, and offers a facility for putting it on the wheel, rendering comparison with the wrought iron tire an absurdity — it not being necessary even to take the wheels from the machine for the purpose. Many of them are in successful use on this road, and I consider its curves and other peculiarities the most severe of all existing tests. One set of five feet in diameter, has run 50,000 miles under one of our Passenger Engines, and will, to all appearance, run as many more; and, in the mean time, they have not cost a dollar for repairs or adjustment.

It may be suggested that they might not stand a Northern frost. This is possible; but I believe otherwise, as the weather here is occa-

sionally as severe as in Boston, and if I had charge of a northern road, after the experience I have had here, I would make the trial one of my very first acts.

Respectfully, your Ob't Serv't,

WM. PARKER, General Supt.. etc.

PHILADELPHIA, WILM. AND BALT. R. R. OFFICE,
Wilmington, Del. Jan. 29, 1851.

MR. L. B. TYNG,—

Sir:—We have used the solid Cast Iron Chilled Wheel, and Cast Iron Chilled Tire, for engine drivers, on this road, since 1842. When wrought iron tires under new engines, purchased from time to time, wear out, I invariably replace them with the Chilled Tire of Messrs. Perkins & Mc Mahon, patentees.

These Tires will last, on the average, three times as long as wrought tires; seldom requiring renewals under three years, and lasting much longer usually. We have a set which has been in constant use for five years, and still in fair order. The adhesion supplied by the Chilled Tires, I find in practice with engines of the same model and weight, to be equal to that given by wrought tires. This is certainly a fact, though not an acknowledged one, in general. Those who think otherwise, will in time change their opinions.

I am of opinion that the Chilled Tire is as safe as the wrought, at any temperature. In eight years' use we have broken but one tire out of more than fifty, and that by a violent concussion on the occasion of a 'run off.'

The use of the Chilled Tire, and the ease and rapidity with which it may be replaced, would certainly enable a road to do the same amount of work with fewer engines—since but little time would be lost in laying up an engine for new tires, or for turning down old ones, as must be done when wrought tires are used.

I am yours respectfully,

I. R. TRIMBLE,

Engineer and General Sup't.

OFFICE EASTERN RAILROAD,
Salem, Dec. 23, 1850.

L. B. TYNG, Esq.—

Sir:—Your favor of November 30th, inquiring respecting the Chilled Cast Iron Tires, came duly to hand, and in

answer I will say, that this road have in use one set cast and fitted to the wheel, by Messrs. Bush & Lobdell, upon a twenty-ton first class Passenger Engine, which has run in eight months, 26,639 miles, and, to all appearance, are about as good as when they first commenced running.

In regard to the comparative expense of the cast or wrought iron tires, I do not hesitate to say that the difference would be vastly in favor of the former.

I have ordered a second set, and they will be put on to the engine immediately. Respectfully,

JOHN KINSMAN, Sup't E. R. R.

Reference may also be made to —

B. H. LATROBE,
Chief Engineer Balt. and Ohio R. R., Wheeling, Va.

S. J. HAYES,
Master of Machinery, Balt. and Ohio R. R., Baltimore, Md.

H. W. FARLEY,
Master Mechanic, Eastern Railroad, Boston, Mass.

G. B. KING,
Master Mechanic, Boston and Lowell Railroad, Boston.

G. S. GRIGGS,
Master Mechanic, Boston and Providence R. R., Roxbury.

JOSEPH BLANCHARD,
Engineer, Boston and Lowell Railroad.

WM. H. CLEMENTS,
Superintendent Little Miami Railroad, Cincinnati, Ohio.